ON THE RADICAL CURE OF INGUINAL AND FEMORAL HERNIA BY OPERATION.[1]

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A CAREFUL study of the anatomy and pathology of the abdominal wall in hernia, and an inquiry into the various master operations, bring me to the conclusion that not one operation yet recommended fulfils all the indications requisite for a radical cure. In this decision I have been supported by a study of the relapses and by my own experience. It is surprising what little attention, in works on hernia, is paid to the pathology of the abdominal wall. It is the dike that must be walled up and cemented to prevent leakage. Let the passive intra-abdominal pressure predisposing to rupture be what it may—elongated mesentery, large omentum, or what not—we cannot hope to lessen it to any great extent; but we can strengthen the abdominal wall at the seat of rupture in such a manner as not only to withstand the passive, but also in the vast majority of cases resist the active pressure within the abdomen while straining, lifting, etc. In aiming at a radical cure it is most important to obtain more strength at the seat of rupture than Nature had provided in these cases. If we simply restore the normal rotundity of the peritoneum, the internal ring and canal, as they were in them before the rupture, it is clear that under the same conditions, and with similar causes at work, a recurrence would be almost sure to follow.

Let us briefly consider the anatomical and pathological weak

[1] Read before the Wayne County (Mich.) Medical Society, December 17, 1894.

points in the abdominal wall in ruptured cases of the oblique inguinal variety.

(1) The dimpling at the internal ring. This is the congenital depression in the transversalis fascia at the origin of the spermatic cord, where the vas deferens and the vessels meet. The mere passage of such a vascular cord would lessen the resisting power of the fascia, but when the structures which form it come from different directions, an additional condition, a V-shaped space exists, which predisposes to the occurrence of a rupture. The peritoneum lining it has very little to do with the strength of the belly wall. It is the transversalis fascia that is the all-powerful structure. Its resisting quality is beautifully demonstrated when one is cutting the abdominal wall, while doing an operation or a post-mortem, especially when the intra-abdominal pressure is great, due to the presence of growths or the accumulation of gas, for just as soon as the transversalis fascia is severed out bulges the peritoneum. The internal abdominal ring is formed by this strong fascia, and once the internal pressure overcomes its resistance here, and left without artificial support being supplied, a complete rupture is sure to occur. The hernial protrusion acts like a wedge from within outward, and forces the structures surrounding the deep ring and inguinal canal asunder.

(2) The transversalis fascia is, in old-standing cases, eventually pushed downward, inward, and backward, until the lower border of the ring, not infrequently, reaches the level of the pubic bone. The small normal infundibuliform process has become a large funnel-shaped cavity, so graphically described by Sir Astley Cooper years ago. The importance, therefore, of restoring the deep ring to as small a size as possible without damaging the cord, and of obliterating the pathological funnel-shaped depression, is evident. Macewen was the first to recognize that these two conditions—(*a*) the anatomical infundibuliform process; (*b*) the acquired funnel-shaped depression—must be counteracted in order to prevent frequent relapses, after operation for the cure of hernia, and this he aimed at doing by making use of the sac as a plug, at the peritoneal aspect of the internal abdominal ring.

My experience with Macewen's operation, in all those cases where there was a good-sized sac, and not too large an internal ring, nor an hypertrophied cord present, was all that could be desired. It is valuable to retain the sac, but when it is insignificantly small, and the transversalis fascia (at the deep ring) exceedingly relaxed and low down, it is not sufficient to fill the whole concavity at the seat of rupture. Let me say, however, that a small sac folded upon itself is better than no sac at all, and in support of using it as a tampon let me here repeat what I have so often said before, that it is not much more liable to become absorbed than a severed tendo Achillis, because, somewhat like it, its structure is comparatively a passive one, and of fully-matured white fibrous tissue. It has been my fortune to examine an anatomical preparation in the possession of Professor Macewen, from a patient cured by his operation, who without wearing a truss had done heavy work for years, and then died of an aortic aneurism. The specimen showed the inguinal canal firmly closed, and at the abdominal aspect of the internal ring lay the sac folded upon itself into a dense cushion, which absolutely prevented any chance of a return of the hernia. Macewen told me that the rupture was one of long standing, and the sac very large and composed principally of mature fibrous tissue. Should the rupture be recent, and the sac composed of the elastic delicate peritoneum, then I can readily understand the correctness of Bassini's observation that, at an autopsy ninety-five days after an operation, somewhat like Macewen's, not a trace of the tampon could be differentiated. I fancy, however, that the peritoneum must have been somewhat thickened at that situation, although the reparative plastic material had obscured it. That the tampon "must of necessity leave a hard painful swelling slow to disappear," as stated by Marcy, of Boston, has not been my observation, in a single instance, of a large number of cases.

(3) The third condition—a pathological one—necessary to counteract is the overstretched transversalis fascia behind the spermatic cord, which is easily demonstrated by raising the cord from its bed. Bassini, Halsted, Marcy, and others have recognized the importance of restoring the tensity of this strong fascia, and

forming a new deep ring by suturing it from below upward. Whereas Marcy does not, like Halsted and some others, cut through it, I prefer to follow somewhat in his footsteps, as being safer and more secure, particularly with my inversion stitches.

(4) The spermatic cord is sometimes increased in bulk by supernumerary and dilated veins. To Halsted is due the credit of counteracting this pathological condition, by removing all but one or two of the enlarged veins before making a new deep ring. A large cord, carrying a considerable volume of blood, must have been a frequent predisposing cause of relapses. The larger the cord, the greater the diameter of the ring must be; and the compressibility of its veins would readily allow the omentum or bowel to enter the ring during the maximum of intra-abdominal pressure.

(5) The condition assumed by the muscular aponeuroses deserves careful attention. Some of the changes consequent to the constant pressure for years upon the structures external to the inguinal canal and hernia are, that they first of all assume a tumor-like appearance, which may come and go as the hernial contents protrude or recede. Within a variable time the bulging becomes permanent; and should these parts be now examined the muscular and fibrous portions are found to be thin and overstretched; the muscular tissue more or less fibrous and atrophied; the fibrous elements less resisting; the cremasteric muscle appears like fibrous bands; the external oblique, internal oblique, and transversalis muscles adherent together, making it difficult and sometimes impossible to differentiate one from the other or, indeed, from the sac beneath them with which they also form a strong union; the conjoined tendon is forced inward and backward, while Poupart's ligament is pushed down and outward, and the pillars are found wide apart.

It is interesting to notice the alteration in the surrounding blood-vessels: the deep epigastric artery may be almost obliterated, while the accompanying veins and the superficial vessels are enlarged and more numerous than is normal.

All of the above-mentioned changes cannot be rectified by

any operative procedure; but the abdominal aponeurotic wall can be thickened by overlapping and firmly securing them beneath the cord, while the conjoined tendon and internal pillar, on the one hand, and Poupart's ligament and the external pillar, on the other, can be approximated. While these different conditions and alterations are fresh in our minds, let us briefly associate with them the shortcomings of the principal operations that have hitherto found most favor with the profession in endeavoring to effect a radical cure.

I. Czerny's operation or Bank's, as it is called in Great Britain, consists in removing the sac below a ligature, and of suturing the pillars together.

Objections.—(1) The sac is removed.

(2) The infundibuliform process is not obliterated.

(3) The tensity of the transversalis fascia is not restored.

(4) The enlarged internal ring is not materially lessened.

(5) An enlarged spermatic cord is not reduced in size.

(6) The abdominal aponeurosis cannot be as firmly secured in front of the cord without danger as behind it.

(7) Relapses are too frequent.

II. Macewen's operation in selected and, perhaps, in the majority of cases is probably the best herniotomy for radical cure yet produced. In it the sac is utilized as a tampon to obliterate the infundibuliform process, and the canal is closed by bringing the external structures over the conjoined tendon and overlapping it, thus restoring its valve-like form. This is accomplished by means of one mattress suture of extra stout chromic catgut. I cannot understand how surgeons can consider it a complicated operation, and I am sure it is not extremely difficult to perform.

Objections.—(1) A new ring may not be formed by the suture closing the canal, and the tensity of the transversalis fascia is not restored.

(2) An hypertrophied spermatic cord is not reduced in size.

(3) The suture closing the canal passes over the spermatic cord, which, if tied too tightly, endangers the vitality of the tes-

ticle, and it cannot be as firmly secured as when the cord is transplanted.

III. McBurney's operation[1] is a reproduction of the idea conceived and carried into practice by M. Theophile Anger, in 1887,[2] and also by Schede, of Hamburg. The neck of the sac is ligatured as high up as possible, and the sac cut off. The edges of the skin are sewed to the deep fascia, the wound packed with gauze, and allowed to close by granulation-tissue formation.

Objections.—(1) The sac is sacrificed.

(2) Scar-tissue weakens the older it gets. We are well aware of the changes that time works in all cicatricial tissues, rendering them thinner and softer. Lucas Championniere and M. M. Terrier[3] are decidedly of the opinion, as are many others, that scars resulting from granulation-tissue are not preferable to those obtained from healing by first intention, with which we agree.

(3) The tensity of the transversalis fascia is not restored.

(4) The pathological internal ring is not lessened in size.

(5) The cord is not reduced when abnormally large.

(6) Relapses are becoming more and more frequent.

IV. Kocher's operation consists in dissecting out the sac, dragging it through a small incision in the aponeurosis of the external oblique, twisting it vigorously upon itself, strongly pulling it down, and laying it over the surface of the external oblique muscle in the direction of the inguinal canal, where it is firmly secured with sutures.

Objections.—(1) See objections 2, 3, 4, 5, and 6 to Czerny's operation, which stand equally good here.

(2) It is not suitable without modification to strangulated, incarcerated, irreducible, or congenital hernia. The class of cases which Kocher selects for his operation is inferred from his own words, as follows: "The structures of the spermatic cord are now separated, in which, by holding them towards the light, the border of a very thin hernial sac can be recognized."[4]

[1] Medical Record, New York, 1889, pp. 35, 312.

[2] Bulletin Société Chirurgie, 1887, p. 664.

[3] Bulletin Société Chirurgie, 1887, p. 680.

[4] ANNALS OF SURGERY, Vol. XVI, No. 6, p. 524.

(3) The results are not of the most promising, and in this connection let me again quote from the same article, p. 505, as follows: "When we assume that about one-fifth of our patients are subjected to a second operation for recurrence," etc. Twenty per cent. of relapses does not speak very highly for an operation which does not include the most difficult cases, and should be discarded on Kocher's own statistics.

On the same page he says, "The chief thing is that we cure four-fifths of the patients, those who remain radically healed with a minimum loss of time and sacrifice of every sort." (An average of seven and a half days in bed.)

V. Bassini's operation has many admirers in America. It consists in ligaturing and cutting off the sac; raising the cord and suturing the border of the rectus, internal oblique, transversalis, and the transversalis fascia to Poupart's ligament behind the cord. The aponeurosis of the external oblique is sewed in front of the cord.

Objections.—(1) The sac is cut off.

(2) The triangular depression, where the vas deferens and vessels meet to form the spermatic cord, is left unguarded except by the elastic peritoneum.

(3) Supernumerary veins are not removed from the cord, should they exist.

(4) I think it an objection that all the aponeurotic structures are not sewed behind the cord.

VI. Halsted's operation differs so much from Bassini's that it may be called quite a different and an original operation. It is a very complete and carefully studied out laparoherniotomy and has added something new to the means which aid in securing a radical cure,—viz., the removal of the superfluous veins from an hypertrophied cord. The skin incision is made in the usual way, but extends upward quite far. "The aponeurosis of the external oblique muscle, the internal oblique and transversalis muscles, and the transversalis fascia are cut through from the external abdominal ring to a point about two centimetres above and external to the internal abdominal ring. The vas deferens and the blood-vessels of the cord are isolated. All but one or two of the veins of the cord are excised." (Halsted.)

The sac is cut away, the peritoneum sutured, and then two other rows of sutures bring the severed structures together. The cord is left subcutaneous.

Objections.—(1) The sac is not utilized.

(2) The six or eight mattress sutures are inserted in such a manner that, when tied, an eversion is effected which leaves, internally, a certain amount of concavity along the whole line of the incision.

(3) The V-shaped depression where the vas deferens and vessels come together is not strengthened.

(4) There is too much cutting of important structures situated above the internal abdominal ring. It is practically a laparotomy.

In Dr. Halsted's[1] paper it is stated that "the communication between the sac and the abdominal cavity is sometimes large enough to admit one's hand."

The severance of the three abdominal muscles and deep fascia above the internal abdominal ring is not necessary. We know that simple abdominal section in the hands of the best operators is (in a certain proportion of cases) followed by rupture. Every structure cut which strengthened the abdominal wall has to be sewed. The more extensive the cutting the more numerous the stitches must of necessity be. In every stitch there is a danger of its being insecure or septic. It is therefore clear that this operation introduces additional predisposing causes of relapses.

From the trend of the foregoing remarks on and objections to the mentioned operations, the character of the combined operation advocated by myself may have already been anticipated. I will now endeavor to describe it.

Operation.—The incision, three or four inches in length, extends parallel to Poupart's ligament over the inguinal canal to the pubic spine. All the structures in front of the inguinal canal from the internal to the external abdominal rings are rapidly divided, and the blood-vessels secured without staining the tissues. The sac is dissected out, almost invariably opened for inspection,

[1] Annals of Surgery, 1893, Vol. xvii, p. 542.

and its neck loosened from its deep attachments with the finger (Macewen). It is then several times transfixed in a proximal direction with a stitch that has been firmly secured to the distal end, so that when the proximal end is pulled upon the sac is thrown into folds like a curtain. Finally the needle carrying this thread is pierced through the abdominal wall from within outward along the inserted finger between the peritoneum and the transversalis fascia, and made to emerge subcutaneously at the upper angle of the wound, about an inch above the internal abdominal ring (Macewen : Fig. 1). Let it be borne in mind that the needle does not penetrate into the peritoneal cavity. Before fastening the sac *in situ* it is best to raise the spermatic cord and, if necessary, remove the supernumerary veins (Halsted); and even when this is not necessary, it is well to make a circular incision through the fascia propria of the cord, and invert it at the new internal ring. The suture which folds the sac is now pulled tightly, fastened to the external oblique muscle, and the sac adjusted in its proper position. It will be noticed when the cord is raised that the tampon occupies a position at its origin where the vas deferens and vessels meet, and, if of good size, more than fills the infundibuliform process; but when the sac is ligatured or sewed across and cut off, this process is left empty. The next step is the suturing of the transversalis fascia from close to the pubic bone (when necessary) to the root of the cord (Marcy), with three or four of my inversion sutures. When the deep ring is not much enlarged, and the transversalis fascia but slightly relaxed, a couple of stitches may be all that is required. The last one, completing the formation of the new internal abdominal ring, is the most important, just leaving space enough for the cord, and no more. The inversion suture is inserted by piercing the deep fascia parallel to Poupart's ligament in two places from without inward, and from within outward, with the first bite of the needle. The needle is drawn through it, and the thread is carried across to the border of the conjoined tendon, where a similar bite is taken directly opposite. (Fig. 1.)

When all are passed and tied, they restore the tensity of the transversalis fascia, at the same time invert the tissues and cause

a convexity on the internal surface. In passing these stitches, great care is exercised not to include the peritoneum. In some cases the fascia and peritoneum may be adhered together. Then it is wise to place the patient in the extreme Trendelenburg posi-

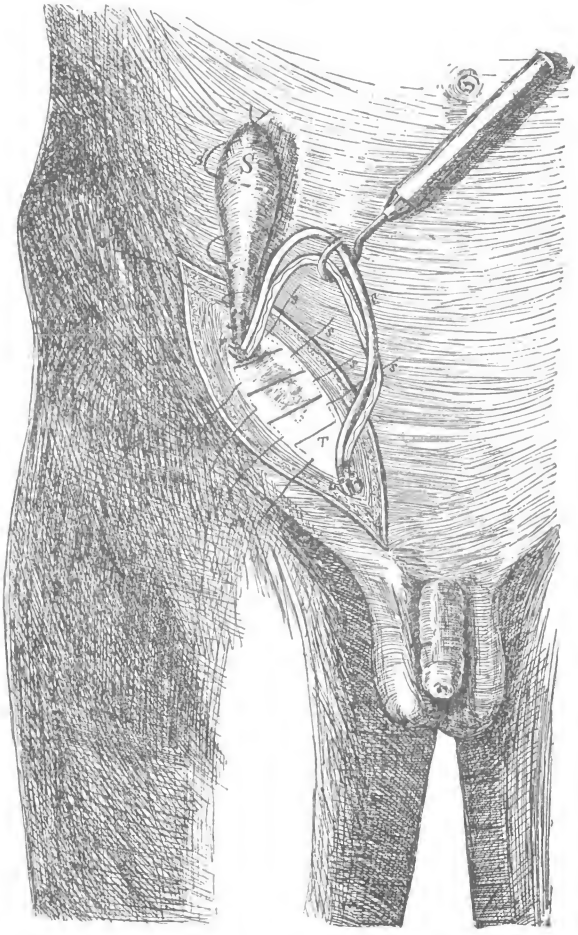

FIG. 1.—S. Sac.
s′. Suture in sac.
C. Cord.
vv. Veins excised.
T. Transversalis fascia, showing deep ring enlarged.
ssss. Sutures in transversalis fascia, restoring the internal abdominal ring.

tion, and always use a fully-curved needle without a cutting edge. It is only necessary to suture that portion of the transversalis

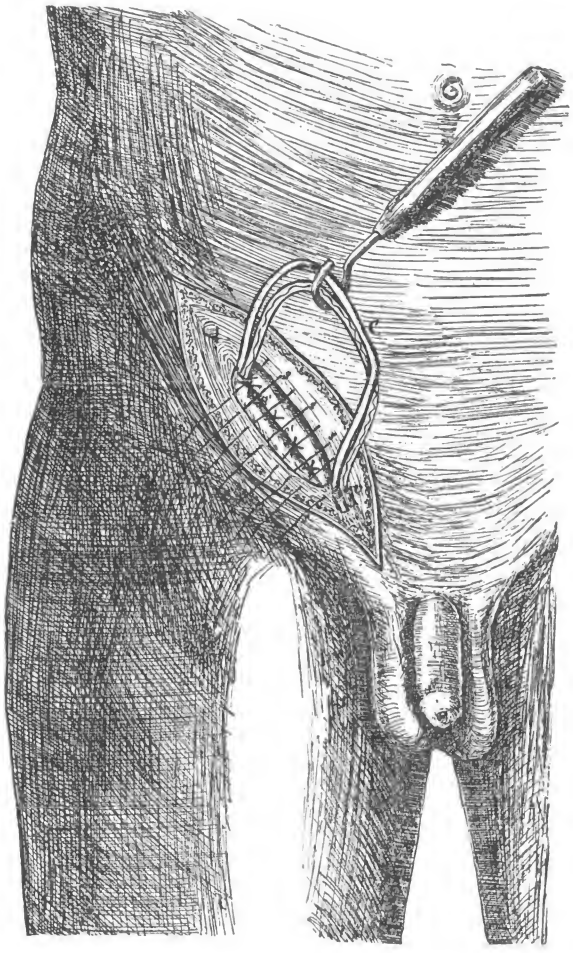

FIG. 2.—C. Cord.
v. Veins excised.
S′S′. Sutures in transversalis fascia tied.
ssss. Sutures closing the canal.

fascia that has become relaxed. The approximation of the muscular aponeuroses of the abdominal wall is done with three or

four mattress sutures from below upward, in such a manner as to bring the external and lower structures—Poupart's ligament, fibres of external oblique, internal oblique, and transversalis muscles—over and in front of the internal and upper structures,—conjoined tendon (Macewen), external oblique, and all beneath the cord (Halsted: Fig. 2).

The first mattress suture is made to penetrate the conjoined tendon and internal pillar in two places with one turn of the needle, from without inward near their lower border, and again from within outward. The two ends of the thread are now passed through Poupart's ligament and the internal pillar from within outward, about half an inch apart. In passing the rest of the sutures, exactly in a similar manner, the practical part to remember is that all the structures from the transversalis fascia to the subcutaneous fat are included, and that they are all tied beneath the cord. When the conjoined tendon is thin and delicate, the border of the sheath of the rectus muscle must be grasped by these sutures. Should the overlapping be considerable, it may be, and often is, necessary to put a few retention sutures along the edge of the overlapping structures. To complete the operation the cord is laid on the external surface of the external oblique muscle, and the skin sutured over it with a continuous buried suture (Halsted), or in the ordinary manner.

I have only operated after this method for about a year and sufficient time has not elapsed to speak of results; but the combination operation (as I call it) should commend itself, in that it is based on anatomical and pathological facts, and upon the results of other operations. It utilizes the sac for a purpose, tightens up the transversalis fascia, and makes a new ring for good reasons; it reduces the size of the spermatic cord when it is redundant; it makes the best use of the aponeuroses to thicken and strengthen the abdominal parietes; and it is suitable to every degree and form of oblique inguinal hernia, from bubonocele to complete scrotal, even incarcerated or strangulated.

Should the hernia be congenital, the enlarged tunica vaginalis testis is divided into two parts obliquely from below upward to a point where separation of the serous membrane from the cord is

most easily effected, and each half closed by itself,—the one forms a neat tunic for the testicle, and the other half a sac to be used as a tampon. (Fig. 4.) The operation is now proceeded with as already described.

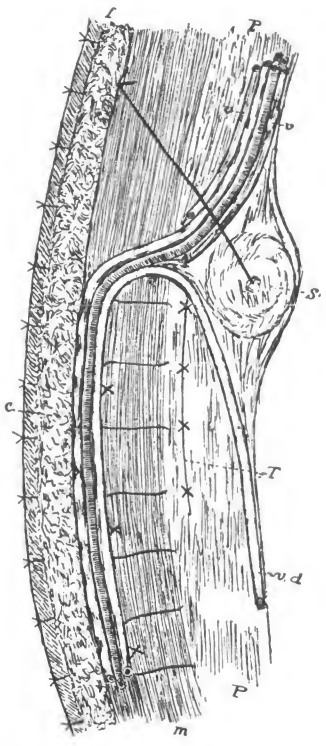

FIG. 3.—C. Cord in its new bed.
m. Muscular wall sutured.
P. Peritoneum.
vv. Veins excised.
v.d. Vas deferens.
I. Integument and subcutaneous tissue.
S. Sac folded upon itself, showing the puckering suture.
T. Transversalis fascia sutured.

Fig. 3 schematically represents a longitudinal section of the completed operation.

The Radical Cure of Femoral Hernia.

The radical cure of femoral hernia has not engrossed the attention of surgeons to the same extent as have operations for the inguinal variety. This may be partly because the material is not so abundant, and owing to the belief of the operation being more difficult to perform. Even our most recent text-book[1] takes no notice of the radical cure of femoral hernia.

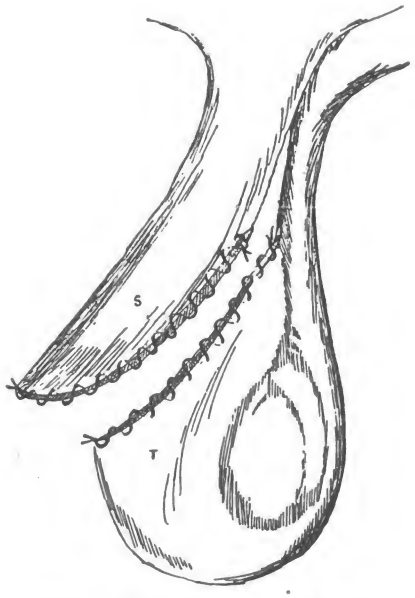

Fig. 4.—The sac in congenital hernia.
S. Sac formed from upper part of tunica vaginalis testis.
T. New tunica vaginalis testis.

The crural rupture is much more liable to become strangulated than is the inguinal. It is not uncommon to find it "strangulated at the time of its first descent," which fact alone calls for more consideration of this affection.

Sir Astley Cooper dissected out the sac and closed the femoral ring by sutures. Mitchell Banks places a ligature round the neck of the sac and then cuts it away, but no attempt is made to

[1] An American Text-Book of Surgery.

close the canal. Ball and Heuston twisted the sac, ligated its neck and cut it away, and closed the femoral canal with sutures. Barker removes the sac after ligating its neck. The stump of the sac is pushed under the femoral arch and the canal closed with sutures which grasp the pubic portion of the fascia lata and

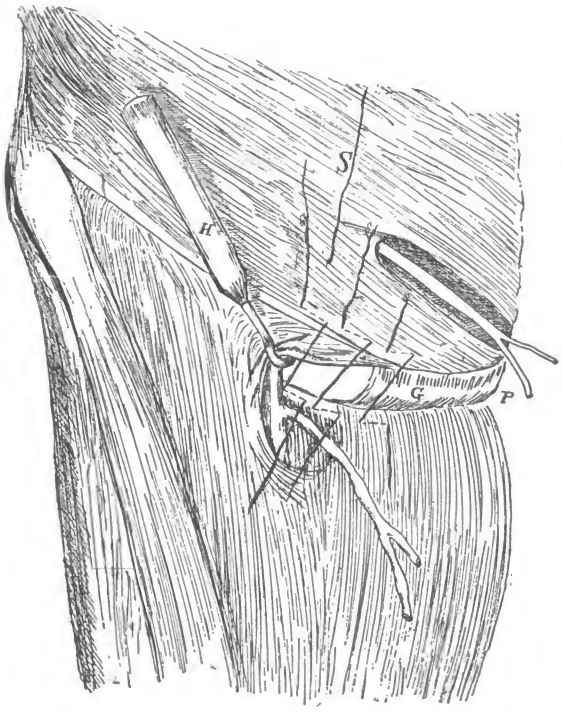

FIG. 5.—H. Blunt hook raising falciform ligament.
S. Suture holding the puckered sac in situ.
sss. Sutures inserted into the pectineal fascia and Poupart's ligament.
P. Pubic bone.
G. Gimbernat's ligament.

Poupart's ligament. Marcy cuts the sac off below a ligature, and closes the canal by sutures of kangaroo tendon. McBurney used the open method, the sac being ligated, cut away, and the wound packed with iodoform gauze. Macewen, of Glasgow, used his unique method, which has not yet been surpassed, especially with

the slight modifications recommended by Cushing, of Boston, and others who have followed in his footsteps. The sac is saved, folded upon itself with a puckering suture, pushed within the abdomen, and fastened there so as to form a prominence on the internal aspect of the peritoneal cavity, which in the most efficient manner possible plugs the femoral canal from within outward with the most desirable material.

Macewen completed the operation by stitching the falciform process to Gimbernat's ligament, thus restoring the valve-like condition of these parts in their natural relationship.

Dr. Cushing closed the femoral ring with a quilted suture,

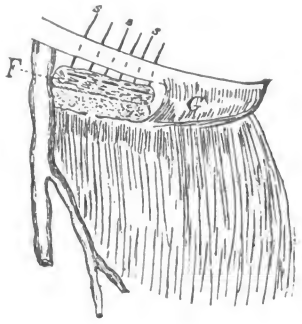

FIG. 6.—G. Gimbernat's ligament.
F. Periosteal flap.
sss. Sutures uniting periosteal flap with Poupart's ligament.

fastening the pubic portion of the fascia lata covering the pectineus muscle to Poupart's ligament before closing the saphenous opening after Macewen's method. This, to my mind, counteracts all the pathological conditions presented in the vast majority of cases of femoral hernia, and a radical cure is effected.

I close the canal with three inversion sutures (Fig. 5), seizing hold of the pubic fascia close to the bone, and then grasping the ligament of Poupart from above downward, which, when tied, recede the falciform process behind them into the canal on a level with the deep crural arch. In this position the external structures are closed upon the boss within. When the sac is

small and slender, and Poupart's ligament cannot be brought down sufficiently close to the pectineal fascia to effectually obliterate the femoral canal, there need be no hesitation in raising a periosteal flap from the pubic bone, sewing it with quilt sutures to the deep crural arch (Fig. 6), and then fastening the falciform process beneath it, as already described. I have raised the periosteal covering only in one case, but it admirably suited it, and a most satisfactory result was obtained.

Dr. W. Watson Cheyne[1] described a new method for operating for femoral hernia. The sac was ligatured and cut off and a flap from the pectineus muscle (taking its whole thickness) was raised and sutured into the femoral canal as an external tampon. It is hard to see the philosophy of cutting off a sac which can be readily, safely, and efficiently utilized as a plug, being already fibrous tissue, and raising a mass of muscular tissue which in time becomes converted into fibrous material. Should the sac be too small and the canal large, no doubt Cheyne's flap would be a great help to prevent relapse.

Dr. Josef Fabricius[2] recommends to ligate the sac and cut it off; freely expose the crural canal by division of the superficial layer of deep fascia and removal of loose cellular tissue; the internal attachment of Poupart's ligament is divided, thus relaxing it, and it is then stitched to the pectineal fascia, the origin of the pectineal muscle, and to the periosteum of the horizontal ramus of the pubes. The first stitch is applied next to the femoral vessels, which have been held by a blunt hook towards the ileopectineal eminence, and this stitch prevents them from returning to their normal position. This author also recommends to stitch the superficial layer of deep fascia to the pectineal fascia along the femoral vein. The objections to this operation are,—(1) the removal of the sac; (2) the division of Poupart's ligament; and (3) the permanent displacement of the vessels, if such is possible, would have a tendency to produce a varicocele of the femoral vein.

Bassini[3] has given his method of operating on femoral

[1] Lancet, London, 1892, p. 1039.

[2] Centralblatt für Chirurgie, February 10, 1894.

[3] Archiv für klinische Chirurgie, Band XLVII.

hernia. It consists in removing the sac and then using two rows of sutures, one fastening Poupart's ligament to the pectineal fascia to close the femoral canal, and the other securing the falciform ligament to the pectineal fascia.

Let me recapitulate the steps of the operative procedure I recommend for the radical cure of femoral hernia.

(1) The skin incision is made parallel to Poupart's ligament and half an inch above it. This allows one to reach the neck of the hernia with ease and accuracy; the scar will be out of reach of the pressure or friction of the thigh, and it allows of an examination of the inguinal canal and rings, which is important.

(2) The sac is dissected from the surrounding structures and opened, unless by feeling you are certain that it is empty. As a rule, it is better to open the sac, and, should omentum be found, it is tied with interlocking ligatures and cut away. The raw stump left should be covered with peritoneum before returning it into the abdomen.

(3) The sac is now folded upon itself and fastened within the opening of the crural canal (Macewen). The whole sac is better than the stump of one or no sac at all. It should not be ligatured round its neck and then retained (as is the practice of some surgeons) because its nutrition is directly interfered with, which may cause it to slough off; or, should it live by imbibition from the surrounding structures, as it usually does, degenerative changes are liable to follow.

(4) When the sac is sufficiently large to close the internal opening of the canal, suturing of the pubic fascia to Poupart's ligament, and placing the falciform process into the external opening of the canal by means of the inversion sutures of strong chromic catgut or silk is quite enough.

(5) When the sac is small, the hernial opening large, and Poupart's ligament cannot with ease be approximated to the pectineal fascia, a periosteal flap may be utilized, or a flap of the pectineal fascia and muscle can be raised and stitched to form a buttress instead, as practised by Cheyne. After the above method I have operated but four times.